and wherein spherical aberration of an electron beam passing through said lens array is reduced.

40. The electron gun of claim 35, wherein said at least one mesh grid is biased to an electric potential.--

REMARKS

Claims 1-40 are pending. Claims 1, 4, 18, 25, and 29 are amended. Claims 30-40 are new. Claims 1, 4, 14, 25, 29, and 35 are independent.

DRAWINGS

The Examiner has objected to several of the corrected drawings filed February 22, 2000. Figure 2 has been objected to because numeral (25) has been omitted. Figure 2A is objected to because numeral (20) is denoted twice, and the liner flange has been omitted. Figure 2B is objected to because numeral (22) has been omitted.

With respect to the objection to Figure 2, Applicants respectfully submit that the proposed drawing change attached hereto includes reference numeral (25). With respect to the objection of numeral (20) being denoted twice in Figure 2A, Applicants submit that the attached proposed drawing change now includes only one occurrence of numeral (20).

With respect to the omission of the liner flange (21) in Figure 2A and the omission of the weld (22) in Figure 2B, Applicants respectfully submit that the description of Figures 2A and 2B on page 4, lines 31-32, of the specification contained minor typographical errors. This section of the specification has now been amended to state that Figure 2A shows the liner being attached to the electron gun assembly at weld 22, and Figure 2B shows the liner being attached to the electron gun assembly via the liner flange (21). Applicants respectfully submit that the amendment to the specification addresses the Examiner's concerns regarding Figures 2A and 2B. Accordingly, withdrawal of this rejection is respectfully submitted.

35 U.S.C. §112, SECOND PARAGRAPH REJECTION

Claims 1, 3, and 4 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. This rejection, insofar as it pertains to the presently pending claims, is respectfully traversed for the following reasons.

In the outstanding Office Action, the Examiner has rejected claims 1, 3, and 4 because claim 1 recites a charged particle illumination system component comprising only a lens array, whereas claims 3 and 4 recite additional components: an electron gun and a liner tube. The Examiner alleges

that claims 1, 3, and 4 tend to indicate that the lens array, electron [gun], and liner tube are unconnected.

Contrary to the Examiner's allegation, Applicants respectfully submit that claim 1 does not limit the charged particle illumination system component to "only a lens array," merely because the lens array is the only element in the body of the claim. Applicants submit that a claim is not required under 35 U.S.C. §112 recite every element or feature in an invention; on the contrary, it is preferable for claims to be drafted in a form which emphasizes what the Applicant has invented (what is new rather than what is old). In re Dossel, 42 USPQ2d 1881, 1884 (Fed. Cir. 1997).

Applicants further respectfully disagree with the Examiner's statement that the lens array, electron gun, and liner tube are unconnected in claims 1, 3, and 4. Applicant respectfully submit that the claims clearly recite that the illumination system component is either an electron gun (claim 3) or a liner tube connectable to an electron gun (claim 4). Claim 1 clearly recites that the lens array is placed within the charged particle illumination system. Therefore, claims 1 and 3 clearly recite a connection between the lens array and the electron gun, and claims 1 and 4 clearly recite a connection between the lens array and the liner tube.

The Examiner further asserts that usage of the term "is" in claims 2 and 3 (Applicants assume the Examiner means claims 3 and 4) is improper because the lens array can not be simultaneously an electron gun and a liner tube.

Applicants respectfully submit that the claims are not inconsistent with each other. As amended, claim 3 is directed to an embodiment in which the charged particle illumination system component is an electron gun. Claim 4 is directed to an embodiment in which the charged particle illumination system component is a liner tube connectable to an electron gun. Applicants respectfully submit that there is no inconsistency between these claims and the specification.

Applicants respectfully submit that claims 1, 3, and 4 are not indefinite for the reasons set forth above. Accordingly, Applicants respectfully request reconsideration and withdrawal of this rejection.

35 U.S.C. §102(b) SMITH ET AL. REJECTION

Claims 1-3, 8-10, 14-16, 19-21, and 25-26 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,390,789 to Smith et al. (hereafter Smith). This rejection, insofar as it pertains to the presently pending claims, is respectfully traversed for the following reasons.

Synopsis of Smith

Smith is directed to an electron beam array lithography tool including an electron gun (cathode 13, control grids 14A and 14B, and anodes 15A and 15B) for producing an electron beam, a coarse deflector 11, an array lenslet assembly 23, and a fine deflector assembly 23. The coarse deflector directs the electron beam to a desired lenslet within the array lenslet assembly, and the

lenslet focuses the beam to an associated fine deflector, which directs the beam to a desired point on the target surface (i.e., target semiconductor wafer).

Smith Fails to Teach Claimed Features

Applicants respectfully submit that Smith fails to teach all of the features recited in independent claim 1. As amended, claim 1 recites a lens array that is configured to increase emittance of an electron beam which passes through the lens array. The emittance of the beam is increased because the lens array of the present invention produces a *divergent* electron beam. Applicants respectfully submit that the lenslet array of Smith does the opposite. Smith teaches that the lenslet array produces a *convergent* electron beam that is focused to a desired point of a semiconductor wafer. Therefore, the electron beam does not gain emittance by passing through the lenslet array of Smith, which is required by claim 1. Applicants respectfully submit that independent claim 25, as amended, similarly recites increasing emittance of an electron beam by directing or passing it through a lens array.

With respect to claim 14, Applicant respectfully submits that Smith fails to disclose a method for controlling beam emittance, as recited in the claim. Smith is simply not concerned with the emittance of the electron beam. Rather, the purpose of Smith's invention is for directing an electron beam to a desired point on a target substrate wafer.

Applicants respectfully submit that claims 1, 14, and 25 are allowable at least for the reasons set forth above. Accordingly, Applicants respectfully submit that claims 2, 3, 8-10, 15, 16, 19-21, and 26 are allowable by virtue of their dependency upon claims 1, 14, and 25, for at least the same reasons. Reconsideration and withdrawal of this rejection is respectfully requested.

35 U.S.C. §103(a) SMITH/SCHAMBER ET AL. REJECTION

Claims 4-7, 11-13, 17-18, and 22-24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Smith in view of U.S. Patent No. 5,376,792 to Schamber et al. (hereafter Schamber). This rejection, insofar as it pertains to the presently pending claims, is respectfully traversed for the following reasons.

In the outstanding Office Action, the Examiner imports the teachings of Schamber to remedy Smith's failure to teach or suggest a liner tube connectable to the electron gun.

Synopsis of Schamber

Schamber is directed to an electron microscope including an improved emitter assembly 10 for electron beam emission, and a column assembly 70 for improved beam passage. Schamber discloses a grid 40, kept at a negative potential relative to a cathode 18 of the emitter assembly, to suppress emission to the tip of the cathode through grid opening 44. Schamber discloses an outer

liner tube 76 for vacuum-sealing the column assembly, and a conductive inner liner tube 80 for supporting spray baffles and beam shaping apertures.

No Motivation to Combine Smith and Schamber

Applicants respectfully submit that the only way Smith and Schamber can be combined is by using Applicants disclosure in hindsight, as a blue print, which is not permitted. C.R. Bard, Inc. v. M3 Systems, Inc., 48 USPQ2d 1225 (Fed. Cir. 1998); Interconnect Planning Corp. v. Feil, 227 USPQ 543 (Fed. Cir. 1985); In re Rouffet, 47 USPQ2d 1453, 1459 (Fed. Cir. 1998).

According to the CAFC, the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references.

According to the CAFC, the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. In re Dembiczak, 50 USPQ2d 1614 (Fed. Cir. 1999). Evidence of a suggestion, teaching or motivation to combine may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or in some cases, from the nature of the problem to be solved. Dembiczak at 1617.

Applicants respectfully submit that the Examiner has failed to provide any such showing of a teaching or motivation to combine Smith and Schamber.

In section 13 of the outstanding Office Action, the Examiner asserts that liner tube are commonly used in the art to address the vacuum requirement of a charged particle illumination system, and that Smith acknowledges the necessity of a vacuum environment.

Applicants submit that this assertion by the Examiner would not provide any motivation to one of ordinary skill in the art to incorporate the liner tube of Schamber in the invention of Smith, because Smith teaches that the housing 12 which surrounds the electron gun and the target wafer stage is vacuum-sealed (see vacuum enclosure - column 1, line 66 to column 2, line 2). Therefore, it would be the knowledge of one of ordinary skill in the art *not* to incorporate the liner tube of Schamber into the electron gun of Smith to vacuum-seal the environment, since this is already accomplished by Smith's housing. Accordingly, Applicants respectfully submit that the Examiner has failed to make a proper showing of a motivation to combine Smith and Schamber. Accordingly, reconsideration and withdrawal of this rejection is respectfully requested.

Schamber Fails to Remedy the Deficiencies of Smith

Applicants further respectfully submit that even if proper motivation did exist for making the proposed combination, Schamber fails to remedy the deficiencies of Smith as set forth above with respect to independent claims 1 and 14. Accordingly, Applicants respectfully submit that claims 11-13 and 22-

24 are allowable by virtue of their dependency on claims 1 and 14. Therefore, reconsideration and withdrawal of the rejection of these claims is respectfully requested.

35 U.S.C. §103(a) SMITH REJECTION

Claims 27-29 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Smith. This rejection, insofar as it pertains to the presently pending claims, is respectfully traversed for the following reasons.

In section 16 of the Office Action, the Examiner asserts that Applicants' admitted prior art discloses the SCALPEL, MEBES, and EBES electron beam exposure tools.

Applicants respectfully submit that the present application's disclosure with respect to SCALPEL, MEBES, and EBES fails to remedy the deficiencies of Smith set forth above with respect to independent claim 25. Accordingly, claims 27-29 are allowable by virtue of their dependency on claim 25. Therefore, reconsideration and withdrawal of this rejection is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, reconsideration of the rejection and allowance of claims 1-40 of the present application is respectfully requested.

In the event that there are any outstanding matters remaining in the present application, the Examiner is invited to contact Jason Rhodes, Registration No. 47,305 at (703) 205-8000 in the Washington, D.C. area, to discuss this application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 50-1735 for any additional fees required under 37 C.F.R. 1.16 or under 37 C.F.R. 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH STEWART KOLASCH & BIRCH, LLP

By: _____
John A. Castellano
Registration No. 35,094

JAC/JWR:cb

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

MARKED UP VERSION OF CLAIMS

IN THE SPECIFICATION

Please replace the paragraph beginning on page 4, line 29, and ending on page 5, line 6, with the following rewritten paragraph:

Figures 2(a) and 2(b) illustrate variations on Figure2. In particular, Figures 2(a) and 2(b) both show the mesh grid 23 within a liner 20 attached to an electron gun assembly 1. In Figure 2([a]b), the liner 20 is attached to the electron gun assembly 1 via a liner flange 21 and an electron gun flange 16. In Figure 2([a]b), the liner 20 is attached to the electron gun assembly 1 at weld 22. The liner 20 and electron gun assembly 1 could be attached by other techniques known to one of ordinary skill in the art, as long as the attachment is vacuum tight. Alternatively, the mesh grid 23 could be placed below the boundary between the liner flange 21 and the electron gun flange 16 or below the weld 22, within the electron gun assembly 1, as long as the mesh grid 23 remains within the drift space 19.

IN THE CLAIMS

1. (Amended) A charged particle illumination system component, comprising:

a lens array configured to be placed in said charged particle illumination system component.

wherein said lens array is configured to increase emittance of an electron beam which passes through said lens array.

4. (Amended) [The] A charged particle illumination system component, comprising: [of claim 1]

a lens array configured to be placed in said charged particle illumination system component,

wherein said illumination system component is a liner tube, connectable to an electron gun.

18. (Amended) The method of claim [14] 17, wherein the liner tube and the electron gun are secured vacuum-tight.

25. (Amended) An electron beam exposure tool comprising:

a charged particle illumination system component including a lens array placed in said charged particle illumination system component,

wherein said lens array is configured to increase emittance of an electron beam passing through said lens array.

29. (Amended) [The] An electron beam exposure tool comprising: [of claim 25]

a charged particle illumination system component including a lens array placed in said charged particle illumination system component,

wherein said illumination system component is a liner tube connectable to an electron gun.

New claims 30-40 have been added.